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Research Article

ARTIFICIAL INTELLIGENCE IN HIGHER EDUCATION: CHALLENGES AND OPPORTUNITIES

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A R T I C L E I N F O

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A B S T R A C T

Artificial Intelligence is a booming technological domain that isadvancing pervasively as a result of emerging technologies and is capable of altering every aspect of our social interactions. AI technologies are used to ensure equitable and inclusive access to education. It provides marginalized people and communities, people with disabilities, refugees, those out of schools, and those living in isolated communities' access to appropriate learning opportunities. . Now let us study the AI- based interventions that are being adopted in Higher education and analyze their contributions toward shaping the future of universities and higher education for the better.

INTRODUCTION

Artificial Intelligence is a booming technological domain that is advancing pervasively as a result of the emerging technologies and is capable of altering every aspect of our social interactions. Since its 'birth' at the 1956 Dartmouth Conference, the field of artificial intelligence has continued garnering the interest of academic institutions and industries alike. Because of sweeping changes in recent years (referred to as "the big leap"), economic access to computing power and advances in Machine Learning in education, AI has begun producing new teaching and learning solutions that are now undergoing testing in different contexts. There are two types of AI, namely data-driven through Machine Learning and knowledge-based AI on explicit representation of domain knowledge that a machine would reason about. In 1959, Arthur Samuel coined the term *machine learning* defining the concept as "the ability to learn without being explicitly programmed". At its core, machine learning is simply a way to achieve AI. *Deep learning* is another widely used term, a specific subfield of machine learning, viz. a new take on learning representations from data that puts emphasis on learning successive layers of increasingly meaningful representations. AI thrives on data and it needs data to build its intelligence (e.g., using machine learning. Now let us study the AI- based interventions that are being adopted in Higher education and analyze their contributions toward shaping the future of universities and higher education for the better. AI technologies are used to ensure equitable and inclusive access to education. It provides marginalized people and communities, people with disabilities, refugees, those out of schools, and those living in isolated communities' access to appropriate learning opportunities. For example, telepresence robotics allows students with special needs to attend schools at home or hospital, or maintain continuity of learning in emergencies or crises. In this way, it is able to support inclusion and ubiquitous access. Universities have started using AI algorithms to personalize learning and deliver content that are suited to the students' needs and pace of learning. This will be a significant change for universities, as it would move away from the traditional model of "one module guide for all". It will see educators equipped with data sets to analyze and understand the needs of individuals and work can be automatically adapted to the style and pace of learning for each particular student. Students would be able to study where they want, when they want and using whatever platform they want. This is likely to mean that tablets and mobile phones will become the main delivery methods. "Smart" classroom spaces are now generally equipped with circular tables, laptops, flat screen monitors, multiple projectors, and whiteboards to encourage and support collaborative and engaged active learning. Such classrooms would enhance the learning experience of the students. A classroom connected to the Internet of Things equipped can adapt to the personalized settings to prepare the classroom for different faculty members.

Scope of Ai

Sustainable Development Goal 4 aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, throughout life. AI is a new form of literacy that can impact higher education institutions and

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labour markets. The system would not only help reduce teachers' mechanical workload for more meaningful teaching, but also enable 'intelligent tutoring which is extremely conducive in areas with teacher shortages. A dual-teacher model entailing a teacher and a virtual teaching assistant can replace the teacher's routine task, enabling him/her to focus more on student guidance and one-to-one communication. AI can be used to monitor asynchronous discussion groups, thus affording teachers with information about learners' discussions and monitor learners' learning. At the same time it can map students' individual learning plans, their strengths and weaknesses, learning preferences and activities. Considering the tremendous amount of time spent on grading tests and homework, AI as an assessment tool can be applied to learn how a teacher grades and thus free up the teacher's time grading not only multiple choice tests, but also assess essays. While there is a possibility that some of the daily routine and low-skilled tasks assumed by teachers today can be replaced by AI, teaching as an occupation however cannot not be replaced by machines in the near future. On the other hand, with increasingly intelligent support from AI, there might be more possibilities for teachers to focus on high- skilled tasks, including adaptive creation of educational resources, more effective and efficient teaching methodologies, and better assessment of learning outcomes.

Since there is a high demand for workers with AI skills, it becomes important to provide the existing workforce for up-skilling and re-skilling programmes for career development and lifelong learning. One of the main impediments preventing countries and organizations from incorporating AI into the economy and education is the lack of AI professionals. A way to tackle this impediment is to cultivate local AI talent, create a pool of individuals who have the expertise to develop AI systems and teach AI skills. Higher education can systematically introduce new academic programmes and research entities that would contribute to the capacity-building of local AI talent. Under this direction, the role of universities is prime as it can produce and train AI professionals in large numbers. Strategies to develop AI professionals in universities need dedicated research grants, research conferences and awards, and partnerships with Industry and start-ups.

Global Scenario

If we make a survey of AI operations across the globe we find that China is equipped with more than 34 million multimedia classrooms. About 93% of schools have at least one multimedia classroom. In 2016, China's Ministry of Education established that every educational branch of local governments must allocate at least 8% of its budget to the digitization of education. With 95% of schools connected to the internet, the country is ready for the largest digital education experiment in the world. New technologies are being leveraged to improve education quality, close the gap between urban and rural education and explore new pathways of education for poverty alleviation. For poorer children to have access to high-quality education China is deploying AI-integrated distance classrooms to enable real-time remote interaction with expert teachers. Hujiang, a private digital education company, has developed image and voice recognition software, capable of understanding student facial expressions to give AI feedback online. Liulishuo is an adaptive platform that teaches English to 600,000 students at the cost of a single teacher. One of the biggest breakthroughs so far in China is the experimental design to correct essays with AI. Colleges and universities have been innovating new pathways of poverty alleviation by concentrating on AI and education. China has developed a *Next Generation Artificial Intelligence Plan*, launched in 2017 which sets out a vision for the country to be the world's centre of AI innovation by 2030. The Republic of Korea aims to produce 5,000 new graduates trained in AI every year, beginning in 2020, thus adding 50,000 new AI specialists to its talent pool by 2030 (Government of the Republic of Korea, 2016). The country also intends to provide 10 year support to 'topnotch graduate-schools-turned- research-centres to lead the development of intelligent IT, including AI' through Research Innovation Grants, The UNESCO Education Sector is developing initiatives that would harness AI to achieve SDG 4. For instance, in partnership with Ericsson, UNESCO's ICT in Education Unit is launching the initiative 'Artificial intelligence for Youth' that focuses on scaling up AI skill development for young people. Ministries of education and labour could partner with industry players to share the training 'burden' of bridging the AI skills gap. Since industry stands to benefit from a larger AI-capable talent pool, it should also invest in training and up skilling, recognizing that bridging the AI skills gap is not the education sector's sole responsibility. However, bridging the AI skills gap should not be confined to reforms in formal education. With the existence of mobile technologies, for instance, it has even become more apparent that learning can occur well outside the bounds of traditional, brick-and-mortar educational institutions (Woolf et al., 2013). Massive open online courses (MOOCs) and online learning platforms such as Khan Academy are alternative channels by which individuals can access training to AI with various universities offering online courses on programming, data science and machine learning. MOOC platforms are in fact good examples of learning systems that contribute to bringing training on AI- related skills and use AI techniques to make the most of them. Coursera, edX, , Future Learn, Udacity, CognitiveClass.ai, etc. are examples of such platforms which, in some cases, apply NLP (Natural Language Processing) and Machine Learning in combination with Crowd sourcing, for example, to grade short answers, coding exercises, vocabulary and even automatically generate 'wh' (who/what/when/where/why) questions more effectively. Bangladesh, China, and India, each of them is turning to AI-based technologies to support their teachers and students. Bangladesh has been investing in AI to reach the objective of digitalization. The country already has many AI start-ups using them for the teacher training and school management. In addition, ICT has been made into a mandatory school subject. India has always promoted the policy of Education for all. As of now, India has over 600 million young people and all of them deserve good education, skills, and jobs. AI-enabled systems will bring global classrooms at our fingertips and it would not only empower students but also teachers in upgrading them with the current trends. Such systems could be a boon for rural education, in India that would give the opportunity to learn the way it is learned in an urban setting. In recent times the University Grants Commission has launched the National Academic Depository (NAD) for storing digitized documents like certificates, diplomas, degrees, mark-sheets etc .In 2015, under its under the Digital India initiative

of Government of India, in 2015.This is used by education boards like CBSE, CISCE, NTA etc. to store certificates and mark sheets and other documents of students. Massive Open Online Courses became a huge hit with Government of India taking the plunge through its SWAYAM portal, a platform to host courses which are taught in classrooms from class 9 to post graduation .Another similar initiative is the Global Initiative of Academic Networks (GIAN). GIAN portal delivers courses designed and taught by academics from around the world. The Ministry of Human Resource Development in India, has announced a new PPP Scheme, National Educational Alliance for Technology (NEAT) under which technology will be used for better learning outcomes in Higher Education. The objective is to use Artificial Intelligence to make learning more personalized and customized as per the requirements of the learner. This requires development of technologies in adaptive learning to address the diversity of learners. There are a number of start-up companies developing this and MHRD would like to bring them under a common platform so that learners can access them easily. Educating the youth is a National effort and MHRD proposes to create a National Alliance with such technology developing EdTech companies through a PPP model. The Indian government's initiative of SWAYAM, offering MOOCS will make active learning for the aspiring minds and facilitate accessibility of the learning material to all people, particularly the teachers and the students. To improve the multidisciplinary approach in teaching learning and additionally to sharpen the new age, it has been decided that schools may begin AI "inspire module" of 12 hours at Class VIII itself. A sparkling example in the Indian education space is the application Toppr. The application has created Indian toppers that have religiously depended on its AI-based model. The normal qualification rate for JEE was about 20%, yet Toppr students had a 36% capability rate. This is a huge upgrade in the educational sector, and schools are figuring out how they can consolidate such advancements. Edu Gorilla is another organization that utilizes AI to analyze Big Data in the education business in India. It analyses data from 600,000 schools and 70,000 or more instructing centers to give top quality outcomes to Indian students. This empowers them to be a one-stop shop for everything education-situated in India. Students can depend on one platform to have their inquiries answered. (https://www.analyticsinsight.net/use-of-ai-and-vr-in-the-indian-education-sector/) dated 28.3.2020 In reality; digital agents are a really interesting way to supplement learning. In India due to shortage of real teachers we need more machine tutors to help the progress of individual learners. With AI systems in place, it will now be easier for teachers to focus more on students rather than mundane administrative tasks.AI will give us tools to work, eventually transform the learning experience, the teaching experience and, the economics of higher education.AI systems have resulted in automated and intelligent system in respect of proctored online assessments. It has helped to simplify the exam invigilation process which enables students to appear for exam from any location classroom/home. System is able to invigilate such exam remotely using remote Proctoring. It uses a web camera attached to the computer system to authorize remote students. Many education institutes, corporate, universities have started using this technology to simplify the examination process with the artificial intelligence of Remote Proctoring and onscreen evaluation system where the scores can be auto-calculated. It also ensures that examiner has truly verified all pages of the answer sheet saving the cost of handling physical answer sheets and finally resulting in automated result processing.

Corporate Sector

In the corporate sector IBM is using technology to make an impact on eradicating poverty through the 'Simpler Voice: Overcoming Illiteracy' project. This project uses AI to help adult learners who are illiterate or have low literacy skills, navigate texts with more confidence by translating texts, presenting the basic meaning through visuals or simple spoken word. In Brazil, an EdTech company Geekie– is used by over 5,000 schools across the country to provide customized learning experiences for students (WISE, 2011; Rundle, 2015; Rigby, 2016). Daptio is a South African solution that uses deep analytics and provides personalized learning to teachers, students and content creators in Africa and other emerging markets through its online software service. M-Shule was launched in Kenya in 2016 as a mobile platform filled with lessons based on national curriculum standards delivered via SMS that adapt to each student's skills and abilities using AI technology. Some further Ed Tech initiatives in developing countries also promise to use some elements of AI in education, e.g. Skool Desk (Uganda), Siyavula (South Africa and Nigeria), Virtual Learning Africa and Top Dog (South Africa), private companies developing educational content for students of all levels in Africa; and Zaya Learning Labs (India). In the United Arab Emirates the Ministry of Education has rolled out an advanced data analytics platform with over 1,200 schools and over 70 higher education institutions, totalling over 1.2 million students. This data analytics system contains data on curricula, teachers' professional development, learning resources, financing, operations, performance reports, teacher, student and parent feedback. UAE has a data analytics section in its Ministry of Education, dedicated to developing machine learning algorithms in support of strategic studies on the country's education system. Middle and lower-income countries are also exploring the potential of AI-enhanced EMIS. For instance, in Kenya iMlango is an educational technology program by which Schools measure daily attendance by adopting digital attendance system, enabling quick and easy attendance monitoring, real-time data reporting and high reliability and insight into complex student data patterns. Class and school attendances are tracked using advanced analytics, which are then used by teachers and a field team to identify low-attending pupils. Though at a nascent stage, countries such as Bhutan and Kyrgyzstan are aspiring to create integrated education information management systems based on individual student tracking that allows personalized learning support and efficient and effective school and sector management. The school mapping initiative by UNICEF i**s** exploring the potential of Deep Learning (DL) algorithms in collaboration with academic institutions and private Companies. India is developing AI solutions to ensure that quality education is available in inaccessible areas. In addition, AI is being introduced into the school curriculum. India has launched 'Operation Digital Board', the banner under which like China, 'smart classrooms' are in use instead of traditional blackboards. AI can thus have a major impact on education, as we make the transition from

'Education 1.0' to 'Learning 2.0'. The targets of Learning 2.0 are deep learning and whole-person development, and depend on a human- machine symbiosis.

Opportunities

Implementing AI in education depends on a number of pre-requisites such as an existing school ecosystem within which AI can be integrated and an available infrastructure including connectivity and hardware. Changing the current structures and practices to accommodate AI-based technologies is at present in an incipient stage and will need some amount of trial and error before the best practices are established. International collaborations and partnerships are seen as potential avenues for enabling governments to harness AI technologies to improve the quality of education systems.

In general AI can be used for promoting and supporting lifelong learning, developing new teacher skills and competencies, providing access to teacher and learner resources, creating virtual learning resources such as MOOCs and developing country-specific solutions. 'AI for Education' platform can be established to act as a clearinghouse for open-source AI courses, AI tools, education policies and regulatory frameworks. For AI to be systematically integrated in higher education it is necessary to monitor and assess the impact of the AI development across countries based on data, voluntarily submitted by countries and be mindful of the risks of polarization between those who have access to AI and those who do not have. AI can be used for International cooperation, cross-sectoral cooperation and for strengthening information as well as building coordination among countries.

Given the increasing presence of AI in the workplace, Computational thinking has emerged as one of the key competencies to enable learners to thrive in an AI-powered society. There is clear acknowledgement of the importance of CT skills and incorporate CT in the educational curricula. ICT competencies' shows a clear shift from basic digital literacy to higher- order (computational) thinking skills. The Computer Science Teachers Association (USA) defines CT as a problem-solving process, possessing the following characteristics (International Society for Technology in Education and Computer Science Teachers Association, 2011)**:** to logically organise and analyse data and implement possible solutions with the goal of achieving effective combination of steps and resources, representing data through abstractions such as models and simulations; automating solutions through algorithmic thinking (a series of ordered steps) and transferring problem-solving process to a wide variety of problems.. Many countries have begun incorporating CT in their respective educational curricula. UK has redesigned and implemented a new computing curriculum in 2014, whose aims were more oriented towards fostering an understanding of fundamental principles and concepts in computer science and their applications, (UK Department for Education, 2013). Singapore has started its efforts to develop CT competencies amongst learners. Malaysia has also embedded CT in its educational programme. The launch of Malaysia's # *mydigitalmaker* movement in 2016 is a partnership across the private sector, public sector and academia to "help create and encourage the development of digital making curriculums that are mapped to the objectives set by the Ministry of Education" (Ministry of Education & Malaysia.) In the last few years, one of the interesting developments observed in the evolution of AI is the diversification of new interfaces. They extend far beyond the keyboard and mouse; meaning that users (especially non-expert users) can interact with AI simply by using voice or image recognition. This not only makes the interaction with advanced systems more transparent, but also opens up possibilities for those with lower levels of skills to benefit

Challenges

AI works within complex ecosystems of knowledge, innovation, business and new regulations. Currently, most of the AI developments in education come from the private sector. Companies such as Pearson, McGraw-Hill, IBM, Knewton, Cerego, Smart Parrow, Dreambox, LightSide or Course era are advancing in the introduction of adaptive learning through intelligent algorithms that use Big Data to personalise learning. Most governments are struggling to manage this serge in private sector engagement with AI in education. Experts forecast a 50% growth in the artificial intelligence market between 2017 and 2021 (HTF Market Intelligence, 2018) State policies should be capable of simultaneously addressing multiple questions to generate solutions and regulations, and create or support innovation ecosystems to bring the opportunities of AI to the field of education. AI to date has had meager impact on teaching and learning in higher education, because of the factor of discrepancy: education tends generally to lag behind where new technologies are concerned. Lack of willingness to take risks or to adopt new innovations and scarcity of funds for anything different from traditional methods of teaching militates against the adoption of new technologies in all sectors of education, learning and development (Wheeler, 2019). Many educators need to be convinced that a new idea can enrich or extend learning outcomes and experiences, so the education sectors remain highly conservative toward new technologies. .AI applications for teaching and learning are unlikely to emerge from within mainstream higher education. They are more likely to arrive from outside the formal post-secondary system, through organizations such as LinkedIn, lynda.com, Amazon or Coursera, that have access to the large data sets that make the applications of AI scalable and profitable. . Critical factors such as how the tech- nology and information is presented, for what community, with what levels of skills, and diverse motivations (intrinsic and extrinsic) need to be considered. Such lessons need to be considered by communities that work at the intersection between artificial intelligence, learning and higher education.

The development of public policies regarding AI in education is still in its infancy, but it is a field that will most likely grow exponentially in the next ten years. The state must create partnerships with the private sector to enlarge the AI ecosystem because the public sector will not be able to innovate at such a complex technological level alone. AI can also be a disruptive technology and may deepen the existing inequalities and divides as the marginalized and disadvantaged population are more likely to be excluded from AI-powered education. The result would be a new kind of digital divide: a divide in the use of data□based knowledge to inform intelligent decision□making (Hilbert, 015). Our expectations that everyone should think and act as a computer scientist are un- realistic. The challenge

seems to be enabling higher education to emerge fully into the world of AI without compromising its core principles and values Research is needed to better understand the (unintended) consequences and opportunities

CONCLUSION

There is a great need to sustain AI applications in education in ways that can contribute to making schools better suited to the needs and activities of an AI- empowered society. To do so effectively is not just a matter of financing, but also of assessing in ways that are meaningful for teachers. While AI has many positive applications, there are societal and ethical concerns that should be addressed. (McKinsey Global Institute, 2017) Installing necessary safeguards to prevent data theft is also critical. In education, this becomes even more challenging in the context of young learners, who, in legal terms, cannot express consent regarding the collection and use of their personal data). While the increase in global, regional and national frameworks concerning the protection of personal data certainly marks a growing understanding of how urgent the issue is, many of these frameworks still do not offer adequate protection to citizens, both in policy and practice – particularly in developing countries (World Wide Web Foundation, 2017).

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